

REMARKS

This is a full and timely response to the outstanding final Office Action mailed February 24, 2010. Reconsideration and allowance of the application and pending claims are respectfully requested.

Claim Rejections - 35 U.S.C. § 103(a)

As has been acknowledged by the Court of Appeals for the Federal Circuit, the U.S. Patent and Trademark Office ("USPTO") has the burden 35 U.S.C. § 103 to establish obviousness by showing objective teachings in the prior art or generally available knowledge of one of ordinary skill in the art that would lead that individual to the claimed invention. *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). The key to supporting an allegation of obviousness under 35 U.S.C. § 103 is the clear articulation of the reasons why the Examiner believes that claimed invention would have been obvious. See MPEP § 2141. As stated by the Supreme Court, "[r]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR v. Teleflex*, 550 U.S. at 398, 82 USPQ2d 1385 (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)).

A. Rejection of Claims 11, 13, 15, 18-21, and 24-28

Claims 11, 13, 15, 18-21, and 24-28 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Fonash, et al.* ("Fonash," U.S. Pub. No. 2002/0020053) in view of *Sasahara, et al.* ("Sasahara," U.S. Pat. No. 6,835,488).

1. Claims 11, 13, 15, 18, and 19

Applicant's independent claim 11 provides as follows:

11. A micro-fuel cell, comprising:
- a substrate having a top surface;
 - anode current collectors disposed on the top surface of the substrate;
 - a membrane provided above the top surface of the substrate and contacting the anode current collectors;
 - hollow channels that are positioned above the top surface of the substrate and that pass through the membrane, each channel being defined by the top surface of the substrate and inner surfaces of the membrane;
 - a first porous catalyst layer disposed on the inner surfaces of the membrane; and
 - a cathode current collector provided above the membrane.

In the Office Action, it was argued that Fonash teaches a fuel cell comprising "hollow channels that are positioned above the top surface of the substrate". This is not true. As is shown in Figures 9a and 9b, which were cited in and relied upon by the Office Action, Fonash teaches a fuel cell in which hollow channels *pass through* the silicon substrate. Accordingly, the channels are actually positioned *below* the "top" surface of

the substrate. In view of that fact, the basis for the rejections is flawed and the rejections should be withdrawn.

Later in the Office Action, it was acknowledged that Fonash does not teach channels that “pass through the membrane, each channel being defined by the top surface of the substrate and inner surfaces of the membrane”. In view of that shortcoming, the Office Action cited the Sasahara reference, which was alleged to render obvious providing in Fonash’s fuel cell hollow channels that pass through the membrane (electrolyte). Applicant disagrees that Sasahara renders that modification obvious because there is no basis upon which to conclude that a person having ordinary skill in the art would consider it obvious to modify Fonash’s fuel in that manner. To the contrary, Fonash’s disclosure *teaches away* from such a modification. Specifically, in describing his disclosed fuel cells (examples of which are illustrated in Figures 9a and 9b), Fonash explicitly indicates that forming the “voids” (i.e., the hollow channels) through the silicon substrate is advantageous for various reasons, including “ease of fabrication”. As described by Fonash:

Fuel cells

This invention demonstrates a novel fabrication process for micro-scale fuel cells based on using the sacrificial layer approach according to the present invention. . . deposited columnar void network material is used as a sacrificial layer for channel formation. The columnar void network silicon is removed with high etching selectivity to other structure materials to define channels for fuel cell fabrication. . . .

The advantages of this particular fuel cell design and fabrication include: (1) ease of fabrication, (2) compatibility with lightweight substrates such as plastics and metal foils, (3) ease of combining into stacked

structures and ease of integration with transistors, diodes, or both for power management, (4) ease of integration with sensors for chemical reaction control, (5) ease integration with a variety of micro-fluidics, display pixels, sensors, and detectors for powering various functions, and (6) ease of combining into stacked structures such as those seen in FIG.

3.

Fonash, paragraphs 0142-0144 (non-relevant portions omitted). In view of the above disclosure, a person having ordinary skill in the art would actually be motivated *against* providing hollow channels through Fonash's membrane instead of Fonash's silicon substrate. In other words, Fonash teaches away from the modification suggested in the Office Action. As is well established in the law, "[t]here is no suggestion to combine . . . if a reference teaches away from its combination with another source . . . A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant . . ." *Tec Air, Inc. v. Denso Manufacturing Michigan Inc.*, 192 F.3d 1353, 52 USPQ2d 1294 (Fed. Cir. 1999).

In light of the above reasons, Applicant submits that the rejections of claim 11 and its dependents should be withdrawn.

2. Claims 20, 21, 24, and 25

Applicant's independent claim 20 provides as follows:

20. A method for fabricating a micro-fuel cell, comprising:
providing a substrate having a top surface;
disposing anode current collectors on the top surface of the substrate;
disposing a sacrificial polymer material on the top surface of the substrate and the anode current collectors;
removing the portions of the sacrificial material disposed on the anode current collectors to form sacrificial polymer material portions that remain on the top surface of the substrate;
disposing a first porous catalyst layer on top of the sacrificial polymer material portions;
disposing a layer of a membrane material on top of the first porous catalyst layer and the anode current collectors to form a membrane; and
removing the sacrificial polymer material portions to form hollow channels that are positioned above the top surface of the substrate and that pass through the membrane, the channels being defined by the top surface of the substrate and the membrane.

It was alleged in the Office Action that claim 20 is obvious in view of Fonash and Sasahara. However, the Office Action did not explicitly address each and every limitation of the claim. Instead, the Office Action merely stated that Fonash teaches "a method of fabricating a fuel cell with the use of patterning through the use of sacrificial layer which results in the structure shown in Fig. 9a-9b" and that Sasahara teaches "patterning of the membrane with sacrificial layer." Clearly, such broad brush statements without explicit discussion of Applicant's specific claim limitations do not constitute an "articulated

reasoning” required under 35 U.S.C. §103(a). Accordingly, the rejections of claim 20 and its dependents are improper and should be withdrawn.

Turning to the merits of claim 20, the applied references fail to disclose or suggest several of Applicant’s explicit claim limitations. For example, neither reference discloses or suggests “disposing a sacrificial polymer material on the top surface of the substrate and the anode current collectors”. Fonash discloses no sacrificial “polymer” layer provided on a top surface of a substrate and the anode current collectors. Although Sasahara discloses sacrificial material 132 disposed on a substrate 130 (Fig. 9A), Sasahara does not indicate that the material is a sacrificial “polymer” material or that it is disposed on “anode current collectors”.

In addition, neither reference discloses or suggests “disposing a first porous catalyst layer on top of the sacrificial polymer material portions”. Simply stated, neither reference describes such an action.

Furthermore, neither reference discloses or suggests “removing the sacrificial polymer material portions to form hollow channels that are positioned above the top surface of the substrate and that pass through the membrane, the channels being defined by the top surface of the substrate and the membrane”. As described above in relation to claim 11, Fonash does not disclose or suggest hollow channels positioned above the top surface of a substrate, and it would not have been obvious to form the channels through the membrane.

In light of the above reasons, Applicant submits that the rejections of claim 20 and its dependents should be withdrawn.

3. Claims 26-28

Applicant's independent claim 26 provides as follows:

26. A method for fabricating a micro-fuel cell, comprising:
providing a substrate having a top surface;
disposing alternating anode current collectors and catalyst layers on the top surface of the substrate;
disposing a sacrificial polymer material on top of the anode current collectors and the catalyst layers;
removing portions of the sacrificial polymer material disposed on the anode current collectors to form sacrificial polymer material portions disposed on the catalyst layers;
disposing a layer of a membrane material onto the sacrificial polymer material portions and the anode current collectors to form a membrane; and
removing the sacrificial material portions to form hollow channels that are positioned above the top surface of the substrate and that pass through the membrane, the channels being defined by the top surface of the substrate and the membrane.

It was alleged in the Office Action that claim 26 is obvious in view of Fonash and Sasahara. However, the Office Action did not explicitly address each and every limitation of the claim. Instead, the Office Action merely stated that Fonash teaches "a method of fabricating a fuel cell with the use of patterning through the use of sacrificial layer which results in the structure shown in Fig. 9a-9b" and that Sasahara teaches "patterning of the membrane with sacrificial layer." Clearly, such broad brush statements without explicit discussion of Applicant's specific claim limitations do not constitute an "articulated

reasoning” required under 35 U.S.C. §103(a). Accordingly, the rejections of claim 26 and its dependents are improper and should be withdrawn.

Turning to the merits of claim 26, the applied references fail to disclose or suggest “disposing alternating anode current collectors and catalyst layers on the top surface of the substrate”. Simply stated, the references do not describe such an action. In addition, the references do not disclose or suggest “disposing a sacrificial polymer material on top of the anode current collectors and the catalyst layers” or “removing the sacrificial material portions to form hollow channels that are positioned above the top surface of the substrate and that pass through the membrane, the channels being defined by the top surface of the substrate and the membrane” for reasons described above. Applicant therefore submits that the rejections of claim 26 and its dependents should be withdrawn.

B. Rejection of Claims 16, 17, 22, 23, 29, and 30


Claims 16, 17, 22, 23, 29, and 30 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Fonash* in view of *Sasahara* as applied to claims 11, 13, 15, 18-21, and 24-28, in further view of *Ha, et al.* (“Ha,” U.S. Pub. No. 2004/0241520).

As identified above, *Fonash* and *Sasahara* do not teach aspects of Applicant’s claims. In that *Ha* does not remedy the deficiencies of the *Fonash* and *Sasahara* references, Applicant respectfully submits that claims 16, 17, 22, 23, 29, and 30 are allowable over the *Fonash/Sasahara/Ha* combination for at least the same reasons that claims 11, 20, and 26 are allowable over *Fonash Sasahara*.

CONCLUSION

Applicant respectfully submits that Applicant's pending claims are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested. If, in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (770) 933-9500.

Respectfully submitted,



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